UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FABRICATION OF ELECTRIC BICYCLE FOR DISABLE PERSON

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Mechanical Engineering Technology (Automotive Technology) (Hons.)

by

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TAJUK: **FABRICATION OF ELECTRIC BICYCLE FOR DISABLE PERSON**

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I hereby, declared this report entitled “Fabrication of Electric Bicycle for Disable Person” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor Degree of Mechanical Engineering Technology (Automotive Technology) with Honours. The member of the supervisory is as follow:

…….

(Mr. MUHAMMAD NUR BIN OTHMAN)

ABSTRACT

In the modern society, the electric bicycle consumption is commonly used by the normal people. Hence, there are only a few bicycles for the disable people to use in their daily life. So, it could be like not fair for disable people to spend their time to ride along at parks with the others. From this situation, it is better to do something to help the disable people problem which is need their own electric bicycle. Thus, the decision has been made to fabricate the electric bicycle for disable person with no leg. Besides that, the price also the main reason why this kind of people cannot have their own bicycle, especially the electric bicycle. Therefore, the electric bicycle will be inventing with the reasonable price.

ABSTRAK

Dalam masyarakat moden, penggunaan basikal elektrik biasanya digunakan oleh manusia biasa. Oleh itu, terdapat hanya beberapa basikal elektrik untuk warga kurang upaya untuk digunakan dalam kehidupan seharian mereka. Jadi, ia boleh menjadi seperti tidak adil untuk manusia yang istimewa ini untuk menghabiskan masa mereka untuk menunggang bersama-sama di taman dengan yang lain. Dari keadaan ini, ia adalah lebih baik untuk melakukan sesuatu untuk membantu orang yang kurang upaya yang tiada kaki dengan mencipta basikal elektrik untuk mereka. Jadi, keputusan telah dibuat untuk mereka-cipta basikal elektrik untuk orang kurang upaya tanpa kaki. Selain itu, harga juga menjadi sebab utama mengapa manusia istimewa jenis ini tidak boleh mempunyai basikal mereka sendiri, terutama basikal elektrik. Jadi, basikal elektrik akan dicipta dengan harga yang berpatutan.

DEDICATIONS

I acknowledge my sincere indebtedness and gratitude to my parents and my family for their love, support and sacrifice throughout my whole life. Their sacrifice had inspired me from the day I born until what I have become today. From the day I have born, they have taught me about how to learn and write. Without them, I cannot achieve the success; I cannot find an appropriate word that could properly describe my appreciation for their devotion, support and faith in my ability to achieve what I have today. Lastly, I would like to thanks all people which contribute to my bachelor degree project directly or indirectly. I would like to acknowledge their comments and suggestions, which has crucial for the successful completion of this project.

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LIST OF ABBREVIATIONS, SYMBOLS & NOMENCLATURE

CAD	-	Computer-Aided Design
GMAW	-	Gas Metal Arc Welding
GTAW	-	Gas Tungsten Arc Welding
SMAW	-	Shielded Metal Arc Welding
MIG	-	Metal Inert Gas
TIG	-	Tungsten Inert Gas
FSW	-	Friction Stir Welding
TMAZ	-	Thermo-Mechanically Affected Zone
HAZ	-	Heat Affected Zone
DC	-	Direct Current
BLDC	-	Brushless Direct Current
PbA	-	Lead Acid
NiMH	-	Nickel Metal Hydride
NiCad	-	Nickel Cadmium

CHAPTER 1
INTRODUCTION

1.1 Background of the project

Bicycle is one of the oldest inventions in this world. The first bicycle was invented by German Baron Karl von Drais in 1817 that was called Laufmaschine (German for "running machine"). The bicycle evolving into the electric bicycle which has been found since the late 19th century. Now, everyone in the world is able to have one of these greatest inventions for their own self. The product of electric bicycle is normally created for the normal people and there are only a few bicycles that are built for the disable person. So, in order to fulfill the necessity, the fabrication of electric bicycle for disable person is going made. By understanding the scenario of the current needed, the aim of this study was focused on to fabricate the frame of electric bicycle for disable person. As the normal human being, the disable person is also want to ride a bicycle just like the normal people. So, several step is need to be taken to make this project done. Next, the purpose of this study is to improve the comfort of the bicycle for disable person to ride. This is because the existing bicycle product is not suitable for disable person to ride.

In the fabrication of electric bicycle process, there are several parts that can be divided which are frame body, handle, wheels and motor. For the frame body, the process involve is welding process to assemble part to another part. There are many types of welding which are GMAW or Gas Metal Arc Welding, GTAW or Tungsten Inert Gas, Arc Welding or SMAW and Gas or Oxy Acetylene Welding and Cutting. The main Types of welding used in industry and by home engineers are commonly referred to as Mig welding, Arc welding, Gas welding and Tig welding.

1.2 Problem Statements

In the modern society, the electric bicycle consumption is commonly used by the normal people. Hence, there are only a few bicycles for the disable people to use in their daily life. So, it could be like not fair for this kind of special people to spend their time to ride along at parks with the others. From this situation, it is better to do something to help the disable people problem which is need their own electric bicycle. So, the decision has been made to fabricate the electric bicycle for disable person with no leg. Besides that, the price also the main reason why this kind of people cannot have their own bicycle, especially the electric bicycle. So, the electric bicycle will be inventing with the reasonable price.

1.3 Objectives

The main objective of this research is to fabricate the electric bicycle for disable person. The aim can be achieve by objective below:

I. To find out the process to fabricate the electric bicycle.
II. To find out the suitable material for the body frame.
III. To fabricates the comfortable electric bicycle.

1.4 Project scope

The research is subjected to the following scope:

I. The electric bicycle for disable person with no leg.
II. Assemble the body frame by involve the welding process.
III. Produce the electric bicycle that is easy to bring to everywhere.
IV. The electric bicycle with three wheels.
V. The weights of the person are in the range 50-90 kg.
VI. Not use the electric bicycle in the rainy day.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This section will discuss about the theories and previous research of this project in detail. Besides that, it also explains about the method that will be used in this project.

2.1 Fabrication

The fabrication of the bicycle was done with the help of the CAD drawings (Rajat, Rajan, Meghanath, Pramod, & Sai Murugan, 2015). The welding was done carefully and rechecked for errors in angle and straightness of the members (Rajat et al., 2015).

Consistent casing tubes are developed from strong pieces of steel that are punctured and "drawn" into tubes through a few phases. These are normally better than seamed tubes, which are made by drawing level steel strip stock, wrapping it into a tube, and welding it together along the length of the tube. Consistent tubes may then be further controlled to build their quality and diminishing their weight by butting, or changing the thickness of the tube dividers. Butting includes expanding the thickness of the dividers at the joints, or finishes of the tube, where the most anxiety is conveyed, and diminishing the dividers at the focal point of the tube, where there is generally little anxiety. Butted tubing additionally enhances the flexibility of the edge. Butted tubes might be single-butted, with one end thicker; twofold butted, with both finishes thicker than the inside; triple-butted, with various thicknesses at either end; and quad-butted, like a triple, however with the middle

diminishing towards the centre. Steady thickness tubes, be that as it may, are additionally fitting for specific bicycles. (Ballantine, 1992)

The tubes are gathered into a casing by hand-brazing or welding by machine, the previous being a more work concentrated process and in this way more costly. Composites might be joined with solid paste or plastic covers. The parts are by and large produced by machine and might be appended to the edge by hand or machine. Last alterations are made by talented bike manufacturers. (Ballantine, 1992)

2.1.1 TIG Welding

TIG Welding is the technique for decision for most producers to join outline tubes, as it gives high joint quality and is likewise reasonable. TIG welding is the most widely recognized kind of welding for bike outlines, and was the joining technique utilized for the edges. A photograph of this procedure can be found in Figure 2.1. TIG Welding is a circular segment welding process in which warmth is delivered between a non-consumable tungsten anode and the work metal. TIG welding uses the inactive gas, argon, to keep the weld territory clean which keeps the metal from oxidizing amid the welding procedure. TIG welding is normally picked as the welding technique for thin tubes and is alluring for the bike business since it gives a top notch complete on the weld surface. (Davey, 2013)

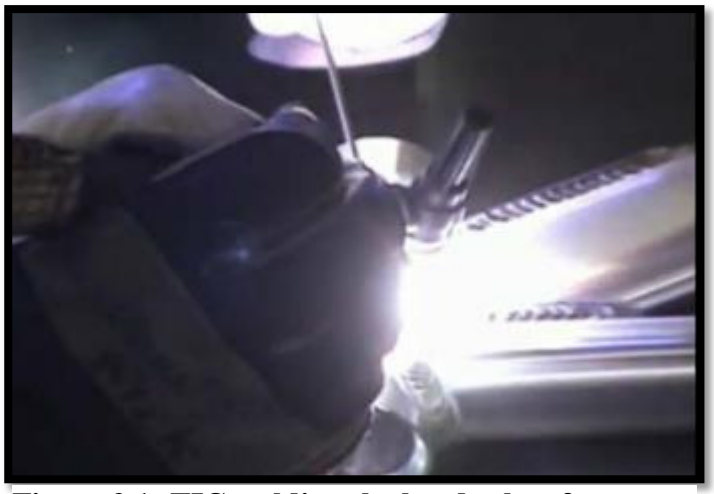

Figure 2.1: TIG welding the head tube of an aluminium bicycle frame.

The significant result of TIG welding is the adjustment in the physical properties of the base material and weld because of the warmth connected to the combination zone. A little territory around the combination zone known as the warmth influenced zone (HAZ) displays the most noticeably awful change in properties and subsequently, weariness disappointments will regularly proliferate from the HAZ. An outline demonstrating the area of the HAZ can be found in Figure 2.2 with the filler material in red and the HAZ in dim. The HAZ is subjected to outrageous temperature change amid the welding procedure which causes the development of encourages.

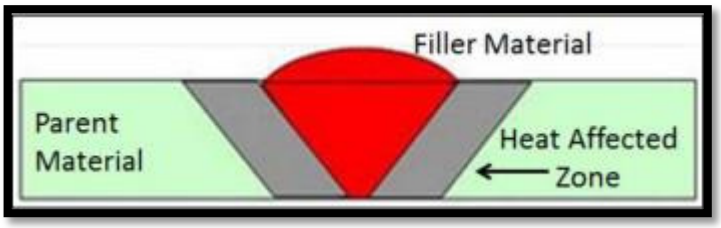

Figure 2.2: Zones of a TIG weld showing parent material, HAZ, and filler material

In any case, there are elective welding methods to TIG welding that deliver welds with less significant warmth influenced zones. One of these welding strategies is Friction Stir Welding (FSW). FSW includes utilizing a non-consumable device with descending weight to create the weld, abstaining from softening the base material and utilizing lower warm contrasted with TIG welding. This procedure makes various zones including the weld zone, thermo-mechanically influenced zone (TMAZ) and a HAZ as found in Figure 2.3. These zones show mechanical properties that are by and large poorer than the parent material, however are superior to anything the properties created utilizing ordinary TIG welding. In spite of the fact that FSW welding might be viable for use on bike outlines, the innovation has not been investigated for this application yet, and subsequently the HAZ made by TIG welding is still an issue for aluminium bike outlines.

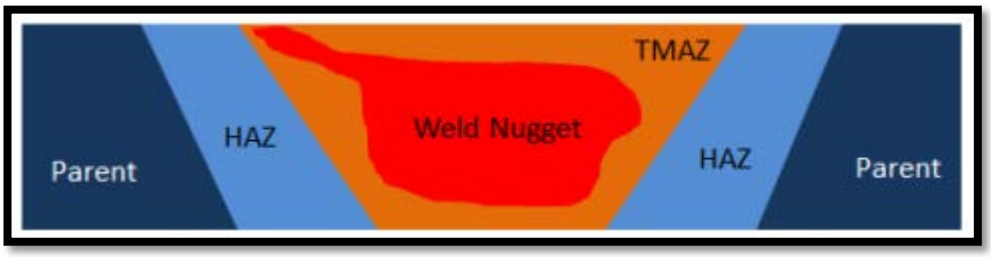

Figure 2.3: FSW diagram showing parent material, HAZ, TMAZ and weld nugget.

2.1.2 Brazing Welding

Brazing, basically, is joining metal to metal by filling the joint with an alternate, dissolved metal at temperatures more than 840F. The softened metal filling the crevice must have the capacity to wet the pieces being joined with the goal that it is drawn into the hole by slender activity. Underneath 840F, the proportional procedure is called patching. On the off chance that the procedure is sufficiently hot to liquefy the metals being gone along with, it gets to be welding or braze-welding.

Figure 2.4: Brazing joining metal process.

Until the late ascent of value TIG-welded and composite bike outlines, most top notch lightweight bikes utilized carries (outer metal sleeve fittings) to join their edge tubing. Filet-brazing is an option technique for developing amazing lightweight bike outlines without the utilization of drags.

Brazing is a joining procedure utilizing a filler metal, similar to metal, that melts underneath the softening temperature of the parent metal work piece. Filet brazing includes developing metal filler metal in a smooth "filet" around joints in figure 2.5.

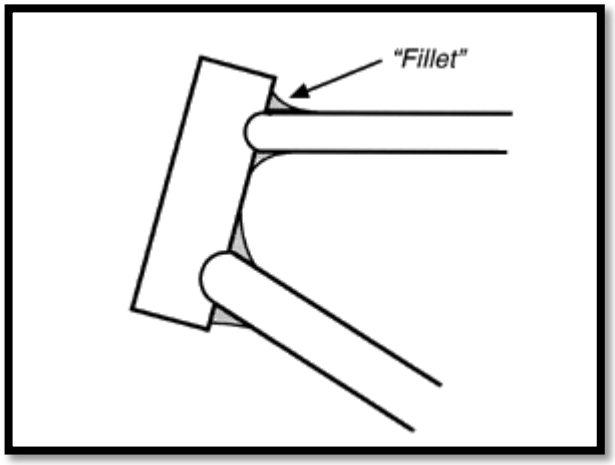

Figure 2.5: Cross section of a fillet-brazed bicycle head tube.

In this technique for bike outline development, "mitering" or cutting the tube closes with the goal that they fit together unequivocally is basic so hairlike activity will draw the liquid filler into holes for a solid joint. The additional thickness of the filet likewise gives quality, and its smooth shape disseminates focuses uniformly.

Filet-brazed bike edges are solid and have a perfect and clean appearance, yet they are unprecedented as a result of the extra craftsmanship required. Carried bike outlines, for instance, are presently made via robotized machines. Custom casing developers still give filet-brazed development, and couple framesets were regularly filet-brazed when carries to fit their edge edges were not accessible.

A decent brazed joint does not depend on some kind of mechanical or substance grip for its quality, which may outperform that of the parent metal, however on a metallurgical bond. An amalgam between no less than one of the constituent metals of base and filler metals is shaped at the interface between them, leaving a brazed joint one involved strong,

persistent metal. Exactly how solid the bond is can be judged by attempting to expel metal filler from steel.

2.2 Electric Bicycle

The most critical part of the bike is the precious stone formed casing, which interfaces the segments together in the best possible geometric design. The casing gives quality and unbending nature to the bike and generally decides the treatment of the bike. The casing comprises of the front and back triangles, the front truly framing even more a quadrilateral of four tubes: the top, situate, down, and head tubes. The back triangle comprises of the chainstays, seatstays, and raise wheel dropouts. Connected to the head tube at the front of the casing are the fork and controlling tube.

For a significant part of the bike's history the edge was built of substantial, yet solid, steel and compound steel. Outline material was ceaselessly enhanced to build quality, unbending nature, daintiness, and sturdiness. The 1970s introduced another era of more flexible composite steels which could be welded mechanically, in this manner expanding the accessibility of light and cheap edges. In the next decade lightweight aluminium outlines turned into the well-known decision. The most grounded metals, in any case, are steel and titanium with future spreading over decades, while aluminium may exhaustion inside three to five years.

Propels in innovation by the 1990s prompted to the utilization of considerably lighter and more grounded edges made of composites of basic strands, for example, carbon. Composite materials, dissimilar to metals, are anisotropic; that is, they are most grounded along the hub of the strands. Hence, composites can be formed into single-piece edges, giving quality where required.

The segments, for example, wheels, derailleurs, brakes, and chains, are generally made of stainless steel. These parts are for the most part made somewhere else and obtained by the bike maker.

2.2.1 Motor Types

Most modern electric bicycles employ brushless DC motors, usually flat hub mounted assemblies consisting of permanent magnet rotor and fixed armature coils energised sequentially by a motor controller (McLoughlin, 2012). There are several types of motor to run the electric bicycles which are hub motor and mid drive motor.

2.2.1.1 Hub Motor

Hub motors are electric motors that are housed inside the hub. Hub mounted motors may be placed on either front wheel or rear wheel hub (McLoughlin, 2012).

Figure 2.6: Hub motor

These are the most common motor that is on an electric bike. There are direct drive hub motors that use the whole hub shell as the electric motor. There are also geared hub motors that have a smaller internal motor with planetary gears that drive the hub shell.

Smooth and careful, the centre point engine is consistently developing as the standard drive technique for not simply ebikes, but rather bikes, sun based autos, and numerous other light electric vehicles. With a centre point engine change, there is no requirement